PHOTOGRAPHIC MANUALS, No. II.

PRACTICAL HINTS

ON

THE DAGUERREOTYPE;

BEING

SIMPLE DIRECTIONS FOR OBTAINING PORTRAITS, VIEWS, COPIES OF ENGRAVINGS, DRAWINGS, SKETCHES OF MACHINERY, ETC.

BY THE

Daguerreotype Process;

INCLUDING THE LATEST IMPROVEMENTS IN FIXING, COLOURING, AND ENGRAVING THE PICTURES; WITH A DESCRIPTION OF THE APPARATUS.

Illustrated with Engravings.

SECOND EDITION, WITH ADDITIONS.

BY THE EDITOR OF "PLAIN DIRECTIONS FOR OBTAINING PHOTOGRAPHIC PICTURES," SCIENTIFIC MANUALS, No. I.

LONDON:

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1846.

ADVERTISEMENT.

The rapid sale of the first Edition (One Thousand Copies) of this little Manual, induces the Proprietors to believe, that it has been found a really useful auxiliary in the practice of the Photographic Art. In preparing a new Edition, they have only so far changed the character of the work as to embody in it such modifications of the process as the Editor has himself found to be improvements, and to replace some of the less important portions by matter of greater interest and utility. With these additions and emendations, it is commended to the notice of those who desire clear and simple directions for conducting an operation which, even when divested of all scientific mystery, is sufficiently delicate and difficult.

London, July, 1846.

PRACTICAL HINTS

ON

THE DAGUERREOTYPE.

NOTWITHSTANDING the many valuable discoveries with which the researches of Sir John Herschell, Mr. Fox Talbot, Mr. Robert Hunt, and other distinguished philosophers, native and foreign, have recently enriched the science of Photography, or as it is now termed, Actino-Chemistry,* the Daguerreotype process, first divulged in 1839, still retains the highest place in public estimation. The extreme beauty and delicacy of the pictures produced by this method, and the comparative simplicity and certainty of the operation, fully justify this preference, and account for the large number of amateurs who are pursuing it in the present day, with more or less success. While, however, the process is simple in itself, it requires much care and nicety of manipulation, which is only to be acquired by continued practice, or by the most careful attention to the directions which are given by proficients in the art,—and without which the operator is exposed to frequent annoyance and disappointment. It is with the view of providing this necessary assistance, that the following Hints have been thrown together, in which all technicalities have been as much as possible avoided, and the directions made short and plain, so as to be easily understood and followed.

* This term was suggested by Sir John Herschell, and adopted at a Meeting of the British Association, in September, 1844, to indicate that department of Chemistry which is connected with the influence of the solar rays.

The history of this invention is well known: Monsieur Daguerre had for some time devoted his attention to the subject of Photography, particularly to the means of fixing the images obtained in the camera obscura. While pursuing these enquiries in conjunction with his partner, Mr. Niepcée, he was led to adopt an entirely new process, which, after many years of study and experiment, was produced under the name of the Daguerreotype. The French government, appreciating the utility of the invention, purchased it, granting to M. Daguerre a pension of 6000 francs per annum for his life, and a proportionable sum to M. Isidore Niepcée, the son of his former partner. Since the introduction of the Daguerreotype very many improvements have been introduced, chiefly with a view to increase the sensibility of the plates on which the effect of the light is now, with fine lenses, almost if not quite instantaneous.

As the possession of a good apparatus is an essential attribute of success in taking Daguerreotype pictures, it will be well to begin by describing the various articles which are necessary or convenient for this purpose. They are as follows:—

Camera Obscura.

The Camera Obscura, used for taking Daguerreotype Pictures (*Fig.* 1,) is a wooden box, furnished in front with a brass tube, in which an achromatic lens is made to slide. The image is received on a piece of ground glass fitted in a frame, which slides in a groove in the back of the camera, and the focus is adjusted by a rack-work in the brass tube of the lens. The frame and glass may be withdrawn, and another frame introduced,—

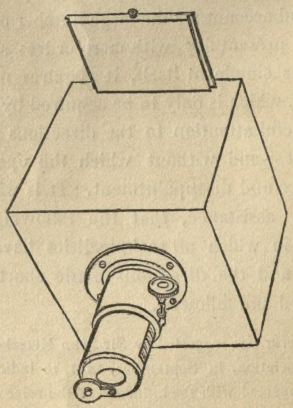
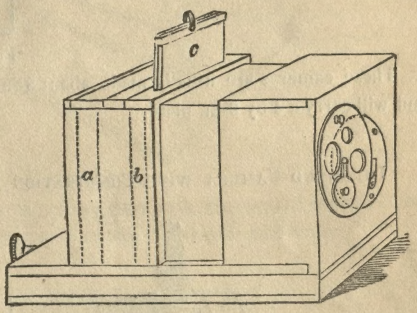


Fig. 1.

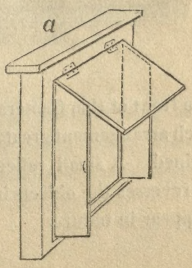
consisting of a wooden back, made to hold the silver plate, and a sliding front, which can be raised when the plate is to be submitted to the action of the rays of light passing through the lens. This camera may be made of any dimensions, according to the diameter of the lens employed.

Willats's Improved Photographic Camera, (Fig. 2,)

Is a great improvement on that just described. The lens, instead of sliding in a brass tube, is bedded in the front of the Camera, by which an increase of light is obtained; the quantity admitted being regulated by a diaphragm, having apertures of different diameter. The back part of the camera slides into the front, and to secure a very accurate adjustment is mounted with a screw. It is moved in or out by turning a small handle at the back. This camera is arranged with two grooves (*a* and *b*,) so as to allow the use of two lenses of different focal powers, according as portraits or views are desired.



The frame with the ground glass (Fig. 3) is furnished with a moveable top and sides, which when extended, exclude the light, and aid the operator in determining the best focus.



The second frame (Fig. 4) consists of a box (*b*) made to receive thin wooden frames adapted to the various sized Daguerreotype plates, which may be placed horizontally or vertically, at pleasure;—this frame is furnished with a sliding door (*c*,) laying over the top of the camera when raised.

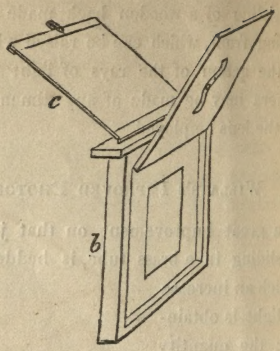


Fig. 4.

These cameras are usually made about 8 inches broad by 6½ high, and will carry a 4 by 3-in. plate.

Improved Camera with Combination Lenses, (Fig. 5.)

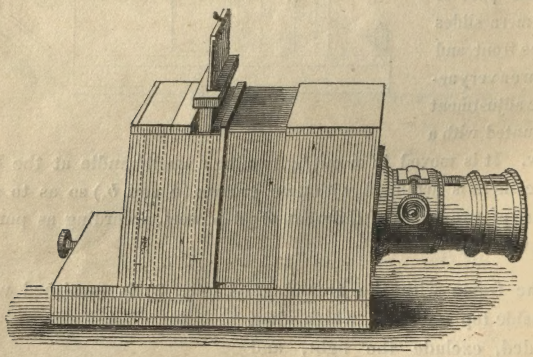


Fig. 5.

The front of this Camera contains a set of double combination lenses, by which arrangement greater nicety of delineation and more rapid action is obtained. A small reflecting mirror is sometimes placed in front, which reverses the objects in the camera, representing them exactly as they appear in nature.

The camera represented, Fig. 6, is a new and very useful article, being made to fold up into the compass of a moderate sized book, and may be carried in the pocket without inconvenience.

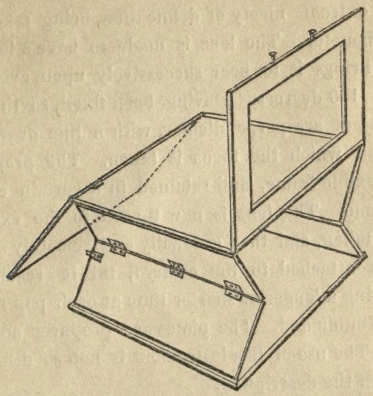


Fig. 6.

It is so arranged as to put together with the utmost ease, and kept securely in its place by a bolt or two in the sides and back.

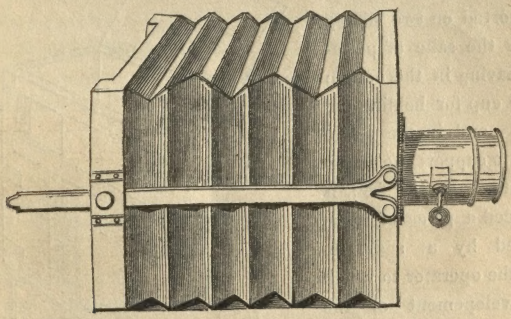


Fig. 7.

Fig. 7 represents another contrivance for rendering the camera obscura more portable; the central part being made of leather, like the bellows of an accordion, may be extended or contracted according to the focus of the lens, and the distance of the object.

DAGUERREOTYPE PANORAMIQUE.

This apparatus is constructed to admit of a view of considerable length and of extrem nicety of delineation, being taken with a lens of moderate diameter. The lens is made to have a horizontal movement, which brings it to bear successively upon every part of the horizon within 150 degrees. Having been fixed, so that the vertical lines of the object are perpendicular, with a line drawn through the ground glass on which the focus is taken. The prepared plate is placed in a flexible frame, and retained in a certain curve, by stops fixed to the frame. The lens is now turned to the extreme limit of the view to be taken, and then gradually and smoothly moved onward by a rackwork attached to the camera, till it reaches the other extremity, waiting a longer or shorter time at each point as the object is more or less illuminated. The plates are prepared and fixed in the ordinary way. The use of this instrument is not so difficult as would be imagined from the description.

Mercury Box.

This is a small box (Fig. 8) supported on two sliding legs, for the sake of portability, having in the bottom an iron cup for holding the mercury, and in the inside a ledge to support the frame and plate. In the front is introduced a piece of glass, protected by a slide, to enable the operator to watch the developement of the picture. A small thermometer is usually added, the bulb of which dips into the iron trough, to enable the operator to observe the temperature of the mercury.

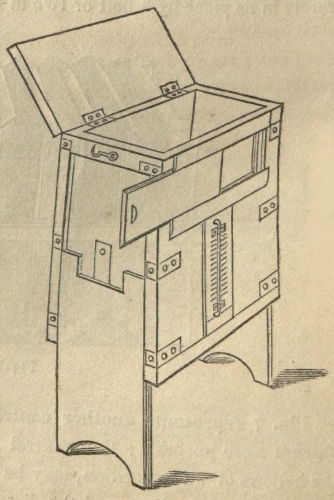


Fig. 8.

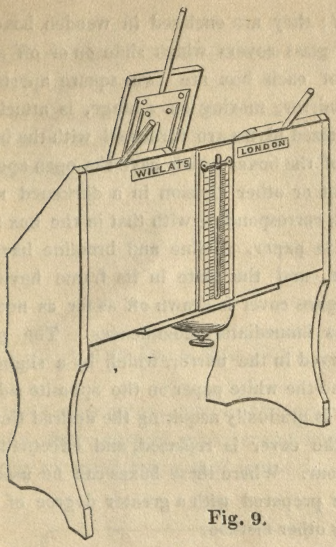


Fig. 9.

A very useful form of mercury box, fig. 9, is made, with divisions for two or more pictures, and with sliding frames to take any size plate; it is furnished with a metal rod, which raises the plate so that the development of the picture may be readily observed. It is used in a dark room, and a lanthorn with a red glass must be employed to inspect the plate.

Iodine and Bromine Troughs, (Fig. 10.)

These are either of glass or Berlin ware, encased in wood; they are furnished with frames of various sizes to hold the plates, and with a cover of slate or glass. They may be used for any of the sensitive solutions.

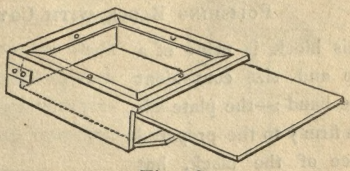


Fig. 10.

Improved Iodine and Bromine Troughs, (Fig. 11.)

These troughs consist of glass pans, much deeper than those repre-

sented in fig. 10; they are enclosed in wooden boxes, such as that in fig. 11, with glass covers which slide on or off at pleasure. On opposite sides of each box are two square apertures, to one of which a small mirror, moving on a hinge, is attached. Frames to suit the various sized plates are furnished with the boxes. When in use, those sides of the boxes which have the open aperture are placed against a wainscot or other division in a darkened room, in which a hole has been cut, corresponding with that in the box; the hole being covered with white paper. Iodine and bromine having been placed in the glass pans, and the plate in its frame having been placed over the top, the glass cover is drawn off as far as necessary, and the colouring process immediately commences. The progress of the colouring is observed in the mirror, which by a slight movement will reflect at the same the white paper on the opposite side, and the plate on the top, which is gradually acquiring the desired tint. When sufficiently colored the cover is replaced, and effectually prevents the escape of the vapour. Where these boxes can be used conveniently, the plates may be prepared with a greater degree of nicety and certainty than by any other method.

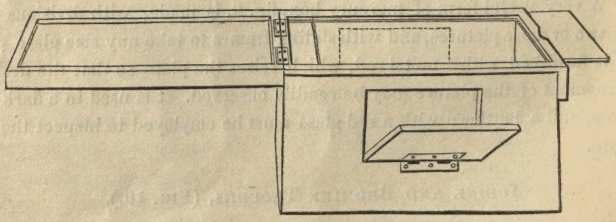


Fig. 11.

Polishing Block with Cover, (Fig. 12.)

This block is made of a shape and size convenient to the hand :—the plate adheres firmly to the prepared surface of the block, but may be readily disengaged when the process of polishing is completed.

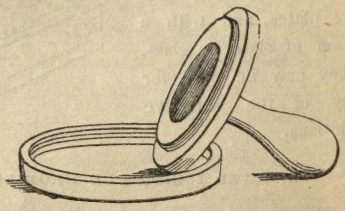


Fig. 12.

Fig. 13 is another form of block, in which the plate is held by the opposite corners. It is capable of adapting itself to various sized plates, and may be fixed to a table, by means of the screw underneath.

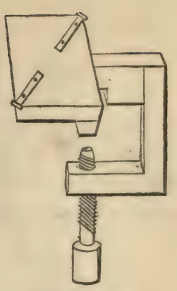


Fig. 13.

The Buff, (Fig. 14,)

Consists of a piece of wood of suitable dimensions, generally about twelve inches by three, covered with several folds of white cotton velvet, thoroughly cleansed from dirt or grease.

Fig. 14.

Plate Box, (Fig. 15.)

These boxes are of wood, or japanned metal, fitted with grooves which prevent the plates from touching each other :—they are very necessary to prevent the plates from being scratched or rubbed.

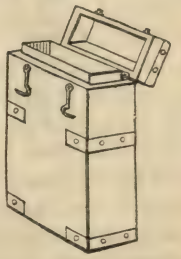


Fig. 15.

Fixing Stand, (Fig. 16.)

This is a wire stand, made to support the plate in an horizontal position, while heat is applied in the fixing process: it is also constructed with righting screws for adjustment upon unequal surfaces.

Fig. 16.

Another form is represented in fig. 17, the plate rests on the regulating screws, which are easily managed; and the stains, which sometimes occur from the plate resting on the wire itself, are thereby prevented.

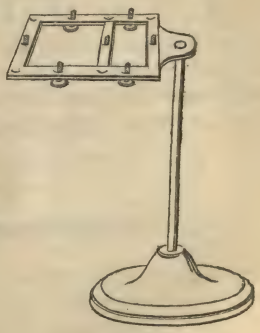


Fig. 17.

The Washing Trough, (Fig. 18,)

Is of metal, or Berlin ware, accompanied by a stand of earthenware, by which the plate is supported in the proper position while washing. An apparatus has been constructed for performing this operation with greater ease and certainty; it is, however, little used.

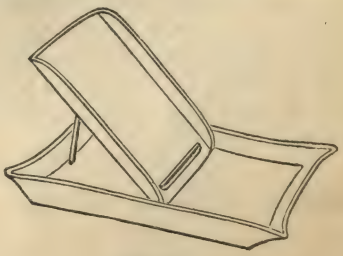


Fig. 18.

Claudet's Frame and Improved Ditto.

Both these frames are used for carrying prepared plates. The first is a thin metal frame, of the same dimensions as the plates it is intended to carry, and is placed between them to keep them from the light, and to prevent their touching each other, or gathering dust. In this state they may be tied together, and carried in the pocket without danger. The second is the same frame in a metal case, which closes tightly, and still more effectually secures them from light, dust, or contact.

The Tripod Staff, (Fig. 19,)

Upon which the camera may be rested, when no other suitable place can be found, is a very necessary auxiliary in taking views ; it is about 4 feet 6 inches high, and carries a small table on which the camera is placed.

There are several varieties differing in their construction and price.

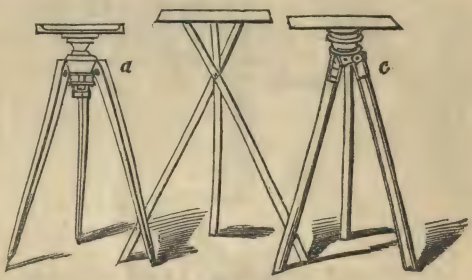


Fig. 19.

The stand should be as solid as possible, to prevent any shaking from the wind, on opening the camera, when used in the open air. In some cases a screw is arranged, to attach the camera firmly to the table.

The Head Rest, (Fig. 20,)

May be fixed to the back of an ordinary chair, and may be raised or lowered, and moved forwards or backwards, at pleasure. It is indispensable in taking portraits.

Fig. 20.

The operator will also require a spirit lamp, with a large wick, for heating the mercury, etc., etc.

Cotton Wool, which must be thoroughly clean, and free from grease.

Prepared Tripoli, or rotten stone.

Prepared Lamp Black.

Olive Oil—Alcohol.

Iodine or Chloride of Iodine.

One or other of the various sensitive solutions.

Distilled Mercury.

Hyposulphite of Soda.

Chloride of Gold, or Hyposulphite of Gold.

Frames of various sizes and patterns are made for mounting the Daguerreotype Pictures with or without morocco cases.

As success in the very delicate operations of the Daguerreotype very much depends upon the apparatus, we cannot too earnestly impress on the amateur the necessity of applying to a respectable optician, well acquainted with the construction and use of the instruments required, and who has an established reputation which he would not willingly damage. A good lens is of the utmost importance. Those manufactured by Voigtglander, Lerebours, Chevalier, and other foreign houses, have a great and deserved name; but very excellent glasses are now produced in England, and with due care in the selection it is by no means necessary to go to a French or German Atelier to get a good, useful lens. The lens must be achromatic, and the double combination lenses are to be preferred. The best are known by the absence of scratches, cracks, or flaws, and by perfect achromaticity and transparency; bubbles are of little consequence if not numerous or large. They should be free from spherical aberration such as make any of the right lines in the picture appear curved, should be immediately rejected. To secure a flat field, the greatest dimension of the plate should be at least one-half the focal length. The longer the focus, the less aberration; for steady motionless objects, it is always the best; for portraits, rapidity being very desirable, the focus may be shortened. Even here, however, accuracy of delineation should not be sacrificed, and rapidity should be sought rather from a good accelerating liquid than from a short focus lens. A diaphragm, which is a circular disc of metal, pierced in the centre with an aperture varying in diameter according to circumstances, may be necessary even for a very good lens. It is intended to exclude all the lateral rays, and to allow those only to pass which are parallel to the axis or centre of the lens. The diaphragm may have an opening of one-seventh of the focal length or more in a combination lens. The time of exposure is somewhat increased by the use of a diaphragm. All the joiner's work in the apparatus should be made of thoroughly seasoned wood carefully adjusted, and as solid as is compatible with neatness and portability.

DESCRIPTION OF THE PROCESS.

We shall now proceed to describe, briefly and clearly, the Daguerreotype process, as practised by the most successful operators of the day; omitting such variations as are not essential to the production of good proofs, and which tend rather to confuse than instruct the amateur, but not knowingly discarding anything which can facilitate his progress. And first, a remark or two on the silver plates, upon which the picture is obtained.

These plates are made expressly for the Daguerreotype. There are several sizes, the more useful of which are as follows :—

No. 1	.. 2	by	$2\frac{1}{2}$	inches.
„ 2	.. $2\frac{3}{4}$	„	$3\frac{1}{4}$	„
„ 3	.. 3	„	4	„
„ 4	.. 4	„	5	„

The purchaser should be careful to select plates of a white metallic lustre, perfectly free from small holes, cracks, flaws, or any kind of blemish. These may be detected by breathing on the plate; and a defect or spot, however small, will become a source of great annoyance when a picture has been obtained, and much time will have been needlessly consumed in polishing and preparing them. Those that have any trace of copper appearing through the silver must be rejected.

Cleaning and Polishing the Plates.

This operation must be performed with great care. Having fixed the plate on the plate-holder, shake over it some finely-powdered tripoli, or rotten stone, add a small quantity of pure alcohol, and with a piece of prepared cotton, proceed to rub the plate with a rapid circular motion, taking care not to press upon it with much force :—the paste formed by the alcohol and tripoli, must then be well cleaned off

with fresh wool and dry tripoli, and the above process repeated two or three times, until a clean surface of pure silver is obtained. This is the best plan for a new plate;—if the plate has been used before, and the picture has not been what is termed fixed, the above operation will also suffice; but if it has been fixed, it is necessary to use a little olive oil with the tripoli in the first instance, or what is still better, a little essence of Bergamot, and then proceed with the tripoli and alcohol as before. If the picture does not readily come off, a little dilute nitric acid may be used, but with great precaution, as if not quickly removed it will eat into the silver. The plate is now ready for polishing: this is best performed by rubbing the plate rapidly over the buff, which must be kept well supplied with prepared lamp-black, pressing the plate hard and evenly against it, and changing the direction frequently, but always ending by polishing in a direction which will cross the picture you wish to obtain upon it; that is, if the plate is to be placed upright in the camera, finish it from side to side, and vice versa. The last polish should be given a short time before the plate is to be used; and any dust which may remain on it should be removed carefully, holding the plate in an inverted position, with a piece of cotton or a camel's hair pencil, just before the process of iodizing.

The best way of cleaning plates, however, is by the use of a lathe. A round buff somewhat larger than the plates to be cleaned having been mounted on the headstock, and a little oil and rotten-stone, well mixed, carefully spread over it, a plate is placed in a metal holder and held firmly against the surface of the buff:—a few turns will remove all trace of any former picture. The buff may be scraped now and then with the back of an old knife to remove the accumulated dirt, and wiped occasionally to take off any dust or grit; a drop or two of oil must be added when it gets too dry. The face of the plate having been partially cleansed from oil by rubbing it on a flat buff kept for the purpose, and the back and sides carefully wiped, it may be placed on the iron wire stand which is made for the purpose of burning off the oil which still remains on the surface. Heat is applied by dipping a little cotton fixed on the end of a piece of iron wire in naptha, lighting it and holding it under each plate till small whitish spots appear upon it. The oil buff is now to be replaced by another kept perfectly free from grease or grit, and well supplied with finely-

powdered charcoal or lamp-black kept ready in a muslin bag. A few turns will give the plate a beautiful even black polish, and it is finished off by buffing it longitudinally as before directed.

Iodizing the Plates.

A small quantity of pure iodine, or a little of the chloride of iodine, diluted with water till it assumes the color of pale sherry, is placed at the bottom of the iodizing pan. If iodine alone is used, and the pan be shallow, it is advisable to strew a little fine sand over it to prevent the too rapid rising of the vapour, and to secure an even coating. The plate is now placed on a proper frame, and laid with its face downwards on the top of the pan. In about a minute, more or less, according to the temperature of the atmosphere, it will be found to have assumed a yellow colour, which will vary from a pale to a rich golden tint, according to the time the plate is allowed to remain in contact with the vapour. The degree of intensity must be varied to suit the quality of the accelerating liquid employed, as will presently be explained. As a general rule the softest and best pictures are produced on plates iodized to a deep yellow bordering on a rose; but care must be taken that the tint does not pass to a violet, or its sensitiveness will be much diminished. The colour of the plate may be inspected by raising it and turning it towards a white light, replacing it quickly on the trough. When sufficiently iodized, it may be laid aside in the frame, with its face downwards, without injury. The iodine will last for a considerable time, if carefully covered with glass or slate; but the chloride mixture requires frequent renewal. The frames should be well varnished, and the same frames must, on no account, be introduced into the camera. It is well to wipe the edges of the trough occasionally with a bit of cotton just moistened with hyposulphite of soda. By the use of the improved pans, page 10, the operation of iodizing is rendered much more simple and certain, the color being observed in a small mirror without removing the plate.

Accelerating Liquids.

There are many varieties of these known by the names of Eau Bromèe, Bromide of Iodine, Redman's Sensitive Solution, Hungarian

Liquid, etc., etc. The two latter are much used in England, and will be found to answer well if properly applied. The liquid is diluted with water in the proportion of about one dram to an ounce and a half. A sufficient quantity having been poured into the trough, the plate is placed over it, and allowed to remain until it acquires a red colour, approaching in some cases to violet. The following rules will guide the experimenter in using the different liquids. If bromide of iodine be used as the accelerating agent, the plate should remain over the iodine solution, until it is of a deep yellow tint: and over the bromide till of a deep rose colour. If Redman's solution, or the Hungarian liquid, a pale yellow and light rose will be found to answer best. As a general rule,—if the yellow colour produced by the iodine be pale, the red should be pale also; if deep, the red must incline to violet. When several plates are to be prepared at the one time, the same solution will serve for all; but it seldom answers to preserve the mixtures for any time; and its use, after keeping, is one great cause of the failures which so annoy amateurs. The bromine contained in these solutions is very subtle, and escapes, leaving little else but iodine remaining, which will after some little time give a red colour to the plate, without rendering it sensitive, entirely disappointing the expectations of the operator. The colour of the plate may be examined as before, but care must be taken to replace the plate over the solution for a few seconds, which removes the effect of the light. When the liquid is renewed at each operation, one inspection at an interval determined by experience will be generally sufficient. From thirty to sixty seconds, according to temperature, are usually required to produce the effect; in certain states of the atmosphere, a much longer time may be necessary. The plate is now ready for the camera, and may be kept for some hours, if due care is taken to secure it from light or dust. Frames to carry prepared plates, may be purchased at the opticians. The prepared plate must be transferred to the camera frame with extreme care, neither to expose it to the light, or rub the surface.

Woolcott's American Accelerator is one of the most sensitive solutions in use, but it absolutely requires the employment of the improved Pans already referred to. The plate having been iodized to a full yellow, is placed over the solution till it acquires a violet tint, and again placed over the iodine till the violet becomes a decided blue.

The Energetic Fluid is a mixture containing iodine and bromine in such properties that the plate may be brought up to the proper color for use at one operation, thus avoiding the difficulties of adjusting the different tints, a quality very valuable to amateurs. It should be frequently renewed.

The bottles containing the sensitive solutions should be protected from the light by a band of black paper; and they should never be kept in a sleeping apartment, the vapour which is constantly escaping being injurious to the health.

Exposure in the Camera.

The form of camera most suitable for the purpose has been already described, page 6. The inside should be carefully dusted before using. Having been placed opposite to the object to be copied, and made perfectly steady, a clear and distinct representation of the object should be obtained upon the ground glass, which must then be withdrawn, and the frame containing the prepared plate introduced in its place,—the lens being covered with the brass cap. The shutter may then be drawn up, the cap removed, and the plate exposed to the light which passes through the lens. The time of exposure must be decided by observation and experiment; as so much depends on the size and construction of the lens or lenses, and the brightness or dulness of the season. With a good achromatic lens, from five seconds to a minute and a half, will be sufficient in almost every case. In another part will be found some Directions for taking Portraits, Views, etc. which will assist the beginner. The instant the assigned time has elapsed, the cap must be replaced, the shutter closed, and the frame may then be withdrawn in readiness for the next operation.

Exposing the Plate to the Vapour of Mercury.

Into the cup at the bottom of the mercury-box put four or five ounces of mercury, which must be pure, dry, and free from moisture. It may be occasionally filtered by enclosing it in Chamois leather, and gradually and carefully twisting the leather, till the mercury is forced through its pores clean and bright. The vapour of the mercury is

raised by the application of a spirit-lamp to the cup which holds the mercury. When a thermometer is attached to the mercury-box, a temperature of about 90 degrees will raise the vapour of the mercury: if the box have no thermometer, the cup may be heated until the mercury is quite warm to the finger. If the mercury cup is removed from the box in order to its being heated, it is well after that operation to wipe the outside, on which a slight steam from the spirit may have settled. The plate is then placed over the mercury, where it must remain till the picture is perfectly developed. Its progress may be observed by the light of a candle through the yellow glass in the front of the box. It generally takes eight to fifteen minutes, or even longer, to perfect the operation; if, however, no outline is visible in about three minutes, either the mercury has not been sufficiently heated, or the picture has been removed too soon from the influence of light in the camera. If the former be the case, the mercury may be again gently heated; but if made too hot, the plate will become covered with small white spots. The details are usually much better developed when the picture has been brought out slowly, and with a moderate degree of heat. Pictures which have been exposed for a sufficient time in the camera, seldom receive any injury from the mercury. The picture should remain in the box till the darker parts are well developed, which may be increased at the last moment till the picture is perfectly distinct.

Setting the Picture.

The picture being sufficiently developed, it should be immersed as speedily as possible in a pretty strong solution of hyposulphite of soda, about fifty grains to the ounce; and when the color is entirely removed, transferred to a vessel of distilled water. The washing troughs already described are very convenient for this purpose. The plate should be carefully washed before proceeding to the next process. The hyposulphite solution may serve many times, if it be carefully filtered before using, and the strength kept up by adding a little of the salt from time to time.

Fixing the Image.

The plate being taken from the water, which should never be

allowed to dry off, is placed upon the fixing stand, which is so constructed as to preserve it in a perfectly horizontal position. The gold solution, which may be purchased of the opticians and chemists, or prepared according to the formula given in the Appendix, is poured on the plate, until it is entirely covered, and the flame of a large spirit lamp applied to the under surface, moving it gently backwards and forwards in such a way that every part may be equally heated. The picture will speedily darken, and then in a few moments become very clear and bright, when the lamp must be withdrawn, and the plate removed, and again plunged into cold water. The plate is now finally washed, by pouring pure water at a boiling heat over it, holding it as perpendicularly as possible. When the plate is quite clean, it may be dried by blowing gently downwards, and when neatly managed it will be quite free from spots. The plate may be supported on a stand, as in the washing apparatus, Fig. 12, page 8, or held at the corner with a pair of pliars. The gold solution must be rejected if it should have changed colour, or deposited any precipitate.

There is an apparatus for washing plates, much used by those who follow Photography as a profession, and which the amateur will sometimes find very useful if not essential. It consists of a small copper trough attached to a barrel of distilled water. This trough contains a moveable frame, upon which the plate rests, and which becomes immersed in water by turning a small tap in the barrel. The trough having been heated by a spirit lamp, until the water is nearly boiling, the plate is raised gently by a wire attached to the frame; and by gently blowing on it as it rises, it may be removed perfectly free from stains.

The following mode of fixing and strengthening pictures by oxidation, has been proposed by Mr. Charles G. Page, M. D., Professor of Chemistry, Columbia College, Washington:—

The impression being obtained upon a highly polished plate, and made to receive, by galvanic agency, a very slight deposit of copper from the cupreaus cyanide of potassa, (the deposit of copper being just enough to change the colour of the plate in the slightest degree,) is washed very carefully with distilled water, and then heated over a spirit lamp, until the light parts assume a pearly transparent appearance. The whitening and cleaning up of the picture by this process

is by far more beautiful than by the ordinary method of fixation by a deposit of gold. A small portrait fixed in this way, more than a year since, remains unchanged, and continues to be the admiration of persons interested in this art. One remarkable effect produced by this mode of fixing, is the great hardening of the surface, so that the impression is effaced with great difficulty. I have kept a small portrait, thus treated, unsealed and uncovered for over a year, and have frequently exposed it in various ways, and rubbed it smartly with a tuft of cotton, without apparently injuring it; in fact, the oxidised surface is as little liable to change as the surface of gold, and is much harder.

To succeed well in this process, the impression should be carried as far as possible without solarization; the solution of the hyposulphite of soda should be pure, and free from the traces of sulphur; the plate should be carefully washed with distilled water, both before and after it receives the deposit of copper,—in fact, the whole experiment should be neatly performed, to prevent what the French significantly call *taches* upou the plate, when the copper comes to be oxidized.

The formula for the Daguerreotype process, which has now been given, will, we trust, enable the amateur to pursue his experiments with confidence and success. He will probably experience some disappointments, however carefully he may attend to the rules which have been laid down, for there are few among even the ablest experimenters who do not occasionally fail; yet his perseverance will often be rewarded by an excellent picture, when perhaps he least expects it.

To obviate, as much as possible, these annoying failures, he should bear in mind the following Cautions, by which he may ofttimes discover the causes which prevent his success:—

Cautions.

1st. Never use the same accelerating liquid more than once or twice, and only at short intervals. It is better to throw it away after preparing such plates as can be prepared at the same time.

2nd. Be sure to replace the plate on the accelerating liquid for a

moment or two after having observed the colour, and before putting it in the camera.

3rd. Wipe the lens, and remove all dust and dampness from the camera before using.

4th. Keep the camera and mercury-box perfectly free from the vapour of iodine, bromine, etc.

5th. Frequently brush the top and sides of the mercury-box to remove any particles which may adhere to them, and which would be likely to settle on the plate. A small painter's tool will do well for this purpose. Filter the mercury through a piece of chamois leather, if it should have film or dust collected upon it; the hyposulphite solution, used to remove the colour of the plate in setting, must also be filtered before using.

6th. Never use the gold solution after it has changed colour, or thrown down a precipitate. This solution requires filtering occasionally.

7th. Do not make the mercury too hot, it will spot the plate, and spoil the picture.

8th. The direct rays of light must not enter the camera in conjunction with those reflected from the object.

9th. If the picture appear clouded, it is probably either because the plate has not been thoroughly cleaned, or has absorbed too much bromine; in the former case, the plate must be cleaned more carefully, in the latter the accelerating liquid must be changed, or its strength reduced. If it be covered with a white film, the plate has been exposed to light before putting into the camera, or too much light has entered the camera, which may be remedied by using a smaller diaphragm. If the whites have become blue, or the picture is thin and poor, it has not become sufficiently deep in colour over the iodine; if browned, it is solarized.

COLOURED DAGUERREOTYPES.

Daguerreotype Portraits are now frequently met with beautifully colored; but the coloring is a process requiring great care and judgment, and many good pictures are spoilt in fruitless experiments. Several different methods of coloring have been proposed. The simplest mode appears to be that of using dry colours prepared in the following manner. A little of the colour required, very finely ground, is thrown into a glass containing water, in which a few grains of gum-arabic have been dissolved. After standing a few moments, the mixture may be passed through bibulous paper, and the residue perfectly dried for use. A little of this colour may be rubbed off with a small camel's hair pencil, and applied very carefully to the picture, to which it will adhere. Any superfluous colour may be removed by a clear pencil. The flesh tints are obtained by use of chrome yellow, Jaune de Mars, etc. to which a little rouge or carmine may be added. Ultramarine gives a beautiful blue colour, and if the back ground is thus tinted, a portrait is frequently thrown up in a very beautiful manner. By combining these, greens and purples may be obtained, very useful for dresses, curtains, etc.

Mr. Claudet's method is to dip a finely-pointed pencil in spirits of wine, and taking a little of the colour, which must have been pounded with spirits of wine, and again pulverized in a glass mortar, to apply it upon the plate. This coating must be slight, and may be repeated if necessary; but if too much is put on, it is difficult to remove: the dry colour is applied on this coating, to which it will be found to adhere.

Mr. Chevallier's plan is to trace on the glass, which is intended to protect it, the outline of the picture, and then to tint it with the colours used for painting the dissolving views, so as to correspond with the picture underneath. When dry, the tracing may be effaced, the glass fixed, and the picture will then appear through, something in the style of a coloured lithograph.

M. Leotard de Seuze covers the plate with a transparent membrane, or vegetable paper, which he attaches by a solution of gum

or size, heated in a water bath; on this membrane he applies colours, mixed with with spirits of wine and gum, or with white varnish and alum.*

Mr. Page, whose new method of fixing the Daguerreotype proofs is given page 15, has thrown out the following suggestions on the subject of Colouring:—

As copper assumes various colours, according to the depth of oxidation upon its surface, it follows, that if a thicker coating than the first mentioned can be put upon the plate, without impairing the impression, various colours may be obtained during the fixation. It is impossible for me to give any definite rules concerning this last process; but I will state, in a general way, that my best results were obtained by giving the plate such a coating of copper as to change the tone of the picture, that is, give it a coppery colour, and then heating it over a spirit lamp until it assumes the colour desired. I have now an exposed picture treated in this way at the same time with the two above-mentioned, and it remains unchanged. It is of a beautiful green colour, and the impression has not suffered in the least by the oxidation. Should this process be perfected, so as to render it generally available, it will be greatly superior to the present inartistical mode of stippling dry colours upon the impression, for the colour here is due to the surface of the picture itself. For pure landscapes, it has a pleasing effect; and by adopting some of the recent inventions for stopping out the deposit of copper, the green colour may be had wherever desired. In some pictures, a curious variety of colours is obtained, owing to the thickness of the deposit of copper, which is governed by the thickness of the deposit of mercury forming the picture. In one instance, a clear and beautiful ruby colour was produced, limited in a well-defined manner to the drapery, while all the other parts were green.

PORTRAITS.

Without doubt the most valuable application of the Daguerreotype is to the copying the "human face divine," and it is unquestionably

* These three receipts are condensed from M. Lerebour's excellent Traité de Photographie, from which other valuable suggestions are taken.

the most difficult. The professional Photographer who operates under a glazed roof with a carefully arranged light, and an ample supply of the necessary material, often fails in producing really first-rate portraits; and it cannot be wondered at that the amateur, working frequently under very disadvantageous circumstances, should require the most careful attention, and above all exemplary patience to ensure a tolerable degree of success. The following observations, derived from personal experience, or the writings of persons well acquainted with the subject, may serve to diminish the difficulties to which we refer. If the portrait be taken in a room, the sitter must be placed before an open door or window, which gives free access to the light, and it may be well to dispose one or two white screens around to reflect it upon the person; a bright day must also be selected for the operation. If in the open air, place a white canopy over the head of the sitter, a white curtain on one side, and a black, or at least a dark one, on the other. Foggy, hazy, or windy weather, must of course be avoided; the best time for operating, is when the sky is covered with light clouds. For a back ground, nothing is better than a crimson or slate colour druggett; if it is required to be lighter, an old blanket will answer the purpose well.

The dress is a matter but of little importance, but much white is objectionable. Dark-coloured silks and plaids are very suitable, and lace collars and cuffs have a very good effect. The sitter should be comfortably seated, and assume an easy natural position; the head should be kept horizontally, the intellectual rather than the lower part being, if anything, rather nearer the camera. As the sides of the face are sometimes very different, it is necessary to select that which conveys the most pleasing expression; what is called a three-quarter face, is most satisfactory, but there are cases where a profile or a full face is more desirable. The face should be turned towards the darker curtain, the eyes well open and directed to some object placed directly before them, at a proper height. The hands and arms should fall naturally, and should be kept as much as possible in the same plane as the rest of the body, to prevent distortion; for the same reason, the legs should not be put more forward than absolutely necessary. In full lengths the person should rest upon a pillar, piece of furniture, or some other appropriate and elegant object. In a group, each individual should be arranged in a different attitude, but the whole nearly in the same

plane. In all cases the sitters must remain perfectly still, and not remove their eyes from the object, though they may wink them occasionally, rather than suffer them to become staring and fixed. In cases where, from some peculiar marks on the face, it is necessary to take it according to its natural appearance, the use of the parallel mirror will be essential, but the time of exposure will be lengthened at least one-third.

A table with books, vases of flowers, etc. may be arranged at the side of the sitter, and occasionally a painted scene representing a terrace, balcony, garden, etc. may be used as a back-ground. For portraits, a short focus lens is best and due care must be taken to obtain a very clear distinct image. The time required varies from twenty seconds to a minute and a half, according to the position, weather, etc.

Views.—The points from which buildings or views can be taken with the best advantage, vary so greatly that the operator must be left pretty much to his own discretion, in choosing a position. As a general rule in taking a building, monuments, etc., it is advisable to place the camera at a distance of about twice its greatest dimensions, and, if practicable, at about one-third its height. If the whole of the building or buildings be not in the same plane, select the most important portion to be most clearly defined, or take several views, in each of which certain points are brought out more distinctly. If an old and new building are to be introduced in the same picture, which should, if possible, be avoided, a black screen or handkerchief, or some other opaque body, should be placed over the lens for a moment or two, so as to cut off the rays of light reflected from the brighter portions of the object, the position of which may be previously observed on the ground glass. The same precaution should be taken when the sky is very blue, or strongly illuminated by the sun. The best time for taking views, is undoubtedly the earlier part of the day, though good pictures are often taken in the afternoon. The time required to obtain a good impression varies so much according to the lens, the weather, the hour, etc., that no certain rules can be given on the subject,—experience will prove the best guide.

ENGRAVINGS, DRAWINGS, etc. may be copied very beautifully with a little care; the whole of the model being in the same plane, there is little difficulty in producing a good effect. The object to be copied must be placed in a good light, taking care to have every part equally illuminated. To secure sharpness, the model is placed in the open daylight, in which case a proof may generally be procured in about fifteen seconds; in the full sunshine, the impression is made almost instantaneously.

MACHINERY, STATUARY, AND ARTICLES OF VERTU, require to be arranged in suitable positions, so that the light may fall upon the object most effectively. The light may be reflected from mirrors, white linens, etc. etc.

COPYING DAGUERREOTYPE PICTURES.

Very fine copies of these pictures, equal to the original in beauty of delineation, and frequently superior in point of tone, are obtained by means of a camera constructed for the purpose; but its use is almost entirely confined to the photographic establishments. Another mode of copying is by the Electrotype. This process, which will be fully described in a Manual now in preparation, and shortly to be published, may be made sufficiently clear, in a few words, to enable the amateur to make the experiment with a a Dguerreotype proof.

The apparatus figured in the margin, consists of a single cell of a Smee's battery, which consists of a thin sheet of platinized silver placed between two plates of amalgamated zinc; these are immersed in sulphuric acid and water in a suitable jar, and attached to each metal is a binding screw to form the necessary connections.

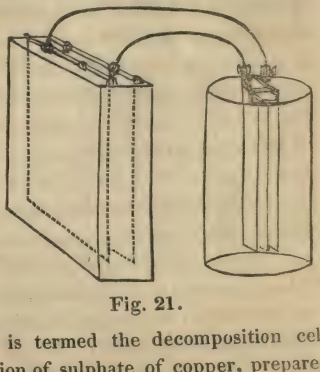


Fig. 21.

The larger cell in the figure is termed the decomposition cell, and is filled with a saturated solution of sulphate of copper, prepared

cold, and carefully filtered, into which the plate to be copied is to be afterwards plunged, together with a plate of copper of the same size, intended to supply the place of the copper withdrawn from the solution.

The Daguerreotype proof must be very carefully executed, avoiding all stains or grease—well washed from the hyposulphite solution—gilded at a low heat, but very thoroughly ; and should be dried off with alcohol which leaves the surface clean and free from spots.

A piece of copper wire is now attached to one corner by soldering, or with a binding screw, taking care that the connection between the plate and the wire is perfect, without which precaution the attempt to electrotype will certainly prove a failure; and the back of the plate is then varnished with a little white wax, or other non-conducting substance. Having prepared a piece of copper of about the same size and thickness as the proof, and attached to it a piece of copper wire, connect them by means of the binding screws with the poles of the battery, in such a manner that the proof shall be connected with the zinc or positive pole, and the copper with the opposite or negative pole and so arrange them that the piece of copper shall be directly opposite and parallel to the proof, at a little distance from it. When this arrangement is made, the proof and the plate should be plunged carefully but rapidly and simultaneously into the decomposition cell, and if the connections are sufficiently established the deposition of copper on the proof will commence immediately. The solution should be stirred occasionally and the deposit ought to be of a brilliant coppery pink, smooth and close grained. If it consist of a brownish powder, or be chrystalised, either the solution is too weak or the battery too powerful, and the operation must be recommenced. The proof may be removed from the solution for inspection occasionally, but must on no account be suffered to dry before the surface is completely covered. Care should also be taken that no air bubbles are left on the surface of the proof after immersion ; they may be removed by blowing downwards on the plate.

When the deposit is of the thickness of a slight card, which it will be in the course of a few hours, it may be removed from the solution. and carefully dried in blotting paper. When dry, the edges all round must be carefully filed, until the deposit will separate from the proof. The counterproof should be immediately placed in a frame or

case under glass, to protect it from air or dust, which would inevitably injure the fine work. These electrotypes are very beautiful and perfect, when carefully managed; but they require practice, and a close attention to the directions given.

ENGRAVING DAGUERREOTYPE PLATES.

Several plans have been suggested for accomplishing this much desired object; none however seem so well adapted as the following, recently patented by M. Claudet, to whom the art is already much indebted. In the specification, the process is explained as follows:—

The process is established upon the following facts, which have come to the knowledge of the inventor:—

1. A mixed acid, composed of water, nitric acid, nitrate of potassa, and common salt, in certain proportions, being poured upon a Daguerreotype picture attacks the pure silver, forming a chloride of that metal, and does not effect the white parts, which are produced by the mercury; but this action does not continue long. Then by a treatment with ammonia (ammonia containing already chloride of silver in solution is preferable for this operation), the chloride of silver is dissolved, and washed off, and the metal being again in its naked state, or cleansed from the chloride, it can be attacked afresh by the same acid. This acid acts better warm than cold.

2. As all metallic surfaces are soon covered, when exposed to the atmosphere, with greasy or resinous matters, it is necessary, in order that the action of the acid upon the pure silver should have its full effect, for the surface to be perfectly purified; this is effected by the employment of alcohol and caustic potash.

3. When a Daguerreotype picture is submitted to the effect of a boiling concentrated solution of caustic potash, before being attacked by the acid, the state of its surface is so modified that the acid spares, or leaves, in the parts which it attacks, a great number of points, which form the grain of the engraving.

4. When the effect of the acid is not sufficient, or in other words, if it has not bitten deep enough, the effect is increased by the following process;—Ink the plate as copper-plate printers do, but with a siccative

ink ; when the ink is sufficiently dry, polish the white parts of the plate, and gild it by the electrotype process ; then wash it with warm caustic potash, and bite in with an acid, which will not attack the gold, but only the metal in those parts which, having been protected by the ink, have not received the coating of gold. By these means the engraving is completed, as by the action of the acid alone it is not generally bitten in deep enough.

5. To protect the plate from the effects of wear, produced by the operation of printing, the following process is employed :—The surface of the plate is covered with a very thin coating of copper, by means of the electrotype process, before submitting it to the operation of printing ; and when that pellicle or coating of copper begins to show signs of wear, it must be removed altogether, by plunging the plate in ammonia, or in a weak acid which, by electro-chemical action, will dissolve the copper, without affecting the metal under it; the plate is then coppered again, by the same means, and is then ready for producing a further number of impressions. This re-coating operation may be repeated as many times as may be required. The following is the description of the whole process, which is divided into two parts, consisting of a preparatory and finishing process :—

Preparatory Engraving.—For this operation, which is the most delicate, it is necessary to have, 1. A saturated solution of caustic potash. 2. Pure nitric acid at 3°° of the areometor of Beaumé (spec. grav. 1.33.) 3. A solution of nitrite of potassa, composed of 300 parts of water and 5 parts of nitrite, by weight. 4. A solution of common salt composed of water 100 parts, and salt 10 parts, by weight. 5. A weak solution of ammoniacal chloride of silver, with an excess of ammonia. The ammoniacal chloride of silver must be diluted with 15 or 20 parts of pure water. In the description of the process, this solution will be called ammoniacal chloride of silver. 6. A weak solution of ammonia containing 4 or 5 thousandths of liquid ammonia. This solution will be called ammoniacal water. 7. A weak solution of caustic potash containing 4 or 5 thousandths of the saturated solution, which will be called akaline water. 8. A solution composed on water 4 parts, saturated solution of potash 2 parts, alcohol 1 part, all in volume. This solution will be called alcoholized potash. 9. Acidulated water, composed of water 100 parts, and nitric acid 2 parts, in volume. Besides, it is

necessary to have three capsulæ or dishes, made of porcelain, large enough to contain the plate, and covered with an air-tight piece of ground plate glass, and two or three more capsulæ which do not require to be covered; two or three glass funnels, to wash the plate; and two or three glass holders in the shape of a spoon or shovel, by which the plate is supported when put in and taken out of the solution, without touching it with the fingers.

The Daguerreotype plate is submitted to the engraving process, after having been washed in the hyposulphite of soda, and afterwards in distilled water.

First process for biting in or engraving the plate.—The following solutions must be put in the capsulæ, in sufficient quantity, so as to entirely cover the plate:—1. Acidulated water. 2. Alkaline water. 3. Alcoholized potash in covered capsulæ. 4. Caustic potash in covered capsulæ. 5. Distilled water.

The plate being put upon the glass holder or spoon, is plunged in the acidulated water, and agitated during a few seconds, then put into a glass funnel, and washed with distilled water. It is taken again with the glass spoon, and plunged in the capsula containing alcoholized potash. This capsula is covered with its glass cover, and then heated by means of a spirit lamp, to about 144° Fahrenheit. The plate must remain in the capsula half an hour, during which the solution is heated now and then, and agitated. During that time, the following acid solution, which will be called *normal acid*, must be prepared; it is composed as follows:—Water 600 parts, nitric acid 45 parts, solution of nitrite of potassa 12 parts, solution of common salt 45 parts. These proportions are in volume. The normal acid must be poured in a capsula, covered with its glass cover, and a sufficient quantity must be kept in the bottle.

When the plate has been immersed in the alcoholized potash during half an hour, it is taken out of the solution by means of the glass holder, and immediately plunged in the alkaline water, and agitated pretty strongly; from thence it is put in distilled water. (A.)

This being done, the plate is plunged into acidulated water, and moved about therein for a few seconds: it is then put in the normal acid. When the plate has been immersed a few seconds in the acid it is taken out by means of the glass holder, taking care to keep it as much as possible covered with the solution, and it is immediately placed

horizontally upon a stand, and as much acid as the plate can hold is poured upon it from the bottle; it is then heated with a spirit lamp, but without attaining the boiling point. During this operation it is better to stir or move about the acid on the plate by pumping it, and ejecting it again, by means of a pipette or glass syringe; after two or three minutes the acid is thrown away, the plate is put into the glass funnel, and there well washed with water, and afterwards with distilled water. (B)

Then without letting the plate dry, it is put upon the fingers of the left hand, and with the right hand some ammoniacal chloride of silver, which is moved about the surface by balancing the hand. is poured upon it; the solution is renewed until the chloride, formed by the action of the acid, is dissolved; the plate is then washed by pouring upon it a large quantity of ammoniacal water, and afterwards some distilled water. (C)

Without allowing the plate to dry, it is then put in the caustic potash, and the capsula being placed upon the stand, the potash is heated up to the boiling point. It is then left to cool (D); and beginning again the operations described from A to D, a second biting is obtained; and by repeating again the operations described in A and B, a third biting is produced. The plate is then dried; in this state the black parts of the plate are filled with chloride of silver.

The plate is then polished until the white parts are perfectly pure and bright. This polishing is done with cotton and "ponce" (pumice stone); afterwards, the chloride of silver, filling the black parts, is cleansed by the means described in B and C. The plate is then dried; but before drying, it is well to rub the plate slightly with the finger, in order to take off from the black parts any remains of an insoluble body which generally remain on it. The preparatory engraving is then finished, and the plate has the appearance of a very delicate aquatint engraved plate, not very deeply bitten in.

Nevertheless, if the operation has been well managed, and has been successful, it is deep enough to allow the printing of a considerable number of copies.

Note.—Sometimes, instead of treating the plate with the boiling potash in the capsula, a similar result may be obtained by placing the plate upon the stand, covering it with the solution, and heating it by means of a spirit lamp, until, by evaporation, the potash becomes in a state of

ignited fusion. By this means the grain is finer, but the white parts are more liable to be attacked.

Last operation of biting in.—This operation requires some of the re-agents before named, and also,

1. A siccative ink, made of linseed oil, rendered very siccative by boiling it sufficiently with litharge ; it may be thickened with calcined lamp-black.

2. An electrotype apparatus, and some solutions fit to gild and copper the plate.

Means of operating.—The plate must be inked as copper-plate printers do, taking care to clean off the white parts more perfectly than usual ; the plate is then to be placed in a room sufficiently warm, until the ink is well dried, which requires more or less time, according to the nature of the oil employed. The drying of the oil may be hastened by heating the plate upon the stand with the lamp, but the slow process is more perfect and certain.

When the ink is well dried, the white parts are cleaned again by polishing the plate with cotton and pounce, or any other polishing powder : a ball of cotton, or any other matter, covered with a thin piece of caoutchouc or skin, can be used for this purpose. When polished, the plate is ready to receive the electro-chemical-coating of gold, which will protect the white parts.

Gilding.— The gilding is obtained by any of the various processes of electrotyping which are known. The only indispensable condition is, that the surface obtained by the precipitation must not be liable to be attacked by any weak acid ; a solution answering this purpose is made of ten parts (by weight) of ferrocyanide of potassium, one part of chloride of gold, and 1000 parts of water, used with a galvanic battery. During the gilding the plate must be turned in several positions, in order to regulate the metallic deposit. In some cases the gilding may be made more perfect, if the plate is covered with a thin coating of mercury before being put in the gilding solution.

When the plate is gilded, it must be treated with the boiling caustic potash, by the process already indicated for the preparatory engraving, in order to cleanse it from all the dried oil or ink which fills the hollows.

The plate is then washed and dried, and when the oil employed has been thickened with the lamp black, the surface of the plate is rubbed with crumb of bread, in order to cleanse and take off the black remaining; then, the white parts being covered and protected by a varnish not liable to be attacked, and the black parts being uncovered and clean, the plate can be bitten in by aquafortis, according to the ordinary process used by engravers.

This operation must be done upon the stand, and not by immersing the plate in the solution.

Before this last biting-in, if the preparatory engraving has not succeeded well, and the plate still wants a sufficient grain, it can be given by the various processes of aquatint engraving.

Before submitting the plate to the operation of printing, in order to secure an unlimited number of copies, it is necessary, as before stated to protect it by a slight coating of copper, which is obtained by the electrotype process; otherwise the printing would soon wear the plate. This coating must be kept very thin, lest the fineness of the engraving, and the polish of the white parts, should be destroyed. In this state the plate can be delivered to the printer.

After a certain number of impressions have been obtained, it will be perceived that the coating of copper is worn in some places; then this coating must be removed, and a fresh one applied in its place. For this purpose, the plate must be purified and cleansed by warm potash, and plunged in a weak acid composed as follows:—Water 600 parts; nitric acid 60 parts; nitrous acid of engravers, 5 parts; all in volume. This acid will dissolve the coating of copper, and the platebeing coppered again by the same means as before, may be again admitted to the operation of printing; and as nothing can prevent the success of a repetition of the same operation, any number of impressions may be obtained. The coating of copper can also be removed by caustic ammonia.

The Daguerreotype Plates engraved by this process, which constitutes the present invention, consist,—

First,—In the discovery and employment of certain properties of a mixture composed of nitric acid, nitrous acid, and hydrocloric acid, in determined or fixed proportions. The two last mentioned acids may be employed either in a free state, or combined with alkaline or other basis. This mixed acid has the property of biting the pure silver

which forms the black parts of the Daguerreotype picture, without attacking the white parts formed by the amalgam of mercury. The result of the action of the biting is to form on the black parts of the picture an insoluble chloride of silver; and this chloride of silver, which when formed stops the action of the acid, is dissolved by ammonia, which allows the biting to continue.

Secondly,—In the discovery of certain properties of a warm solution of caustic potash, and in the employment of the said solution, by which the mercury forming the picture is better and deeper amalgamated with the silver under it, so that many imperceptible points of the amalgam are effected in such a manner that the acid has no action upon them.

Thirdly,—In the discovery and employment of a process which produces a grain favourable to the engraving, by which the biting on the plate is rendered deeper. This is effected by filling the parts engraved with a siccative ink, or any other substance, and then gilding the plate by the electrotype process; the gold is not deposited on the parts protected by the ink. When the plate is gilded, the ink is cleansed by the caustic potash, and the plate may be submitted to the effects of an acid which does not attack the coating of gold, but bites only on the silver in the parts already engraved by the first operation.

Fourthly,—In the employment of a process by which the plate is protected from the wear of the printing operation. This is effected by covering the plate, before printing, with a slight coating of copper by the electrotype process; and when the coating begins to wear by printing, it is removed by a weak acid, or by ammonia, which dissolves the copper without affecting the silver under it. The plate is coppered again, and after another printing the same operation is repeated, so that a considerable number of copies may be printed without much injury to the engraving.

APPENDIX.

We subjoin the formula for making a few of the solutions used in the Daguerreotype process; but we must caution those who may be ignorant of Chemistry, that some of the substances used are deleterious and corrosive, and that great care should be taken that they do not touch the person, dress, or surrounding objects. A drop of bromine for example, accidentally thrown into the eye might easily destroy the sight.

Chloride of Iodine.

The chlorine is procured, by putting pure oxide of manganese, broken into small pieces in a glass retort, and pouring upon it some hydro-chloric (muriatic) acid. The retort communicates by a bent tube with a small bottle containing iodine, which it promptly liquefies. When the resulting liquid becomes a bright red, the operation is complete. The chloride of iodine should be preserved in a bottle well stopped, a little white wax round the stopper will prevent its adhering to the neck of the bottle. In conducting this operation, precaution must be taken that the chlorine does not escape; this gas being highly deleterious.

Eau Bromee.

Add an excess of bromine to pure water* in a bottle, shaking it well for some minutes. To one part of this solution, add 40 parts water, and the mixture of a bright yellow is ready for use.

* If you are not sure of the purity of the water, add a few drops of nitric acid.

Bromide of Iodine.

In a bottle which holds about three ounces, put 30 to 40 drops of bromine,—the quantity is not very important. Add iodine, grain by grain, till the bromine is saturated. The iodine which does not dissolve may remain in the bottle. To one part of bromide of iodine add 200 parts water, and it is ready for use.

Gilding Solution.

The receipt for this solution, as given by M. Fizeau, the inventor of this method of fixing, is as follows:—

Dissolve one part of chloride gold in 800 parts of water, and four parts hyposulphite soda in 200 parts water,—pour the solution of gold into that of soda by little and little, shaking it all the while, the mixture at first slightly yellow becomes perfectly limpid. This mixture may be bought ready prepared of the Opticians.

Comparison of French and English Measures.

Measures of Weight.

	English Grains.	Avord. Weight
Decigramme	1.5433 ..	
Gramme	15.4330 ..	
Decigramme	154.3300 ..	0.022
Hectogramme	1543.330 ..	0.220
Kilogramme	15433.0000 ..	2.204

Measures of Capacity.

	Imperial. Galls.	Pints.
Litre	0 ..	1.76377
Decalitre	2 ..	1.4464